

EXPLANATION OF PLATES IV.-VII.

PLATE IV.

- Fig. 1. *Congromuræna mellissii* Günther.
 2. *Muræna sanctæ helenæ* Günther.

PLATE V.

Leirus moselii, sp. n.

PLATE VI.

Pimelepterus galleii, sp. n.

PLATE VII.

- Fig. 1. *Eudendrium cunninghami*, sp. n. Branchlets with polyps. $\times 18$.
 2. The same. Female sporosacs. $\times 18$.
 3. The same. Male sporosacs. $\times 50$.
 4. *Chondrosia plebeja* O. Schmidt. Surface and vertical section showing pores and pore-canals. *p*, pore; *ic*, incurrent canal. $\times 50$.
 5. The same. Thick slice parallel to and a little below surface. *ic*, incurrent canals; *ec*, excurrent canals. $\times 15$.
 6. Flagellated chamber: *pr*, prosodus; *ap*, aphodus. $\times 750$.
 7. Flagellated chambers. $\times 425$.
 8. Collar-cell. $\times 1000$.

3. Report on the Deaths which occurred in the Zoological Gardens during 1909. By H. G. PLIMMER, F.L.S., F.Z.S., Pathologist to the Society.

[Received January 18, 1910.]

On January 1, 1909, the number of animals in the Zoological Gardens was 3307, and during the year 1996 animals were admitted, making a total of 5303 for the year.

The number of deaths during the year has been 1492, that is about 28 per cent.; but if from the above total we subtract 548 animals which did not live for six months after their arrival in the Gardens—that is, roughly, the time at which we find they have got entirely used to their new environment—the percentage of deaths is reduced to 17·8, that is practically the same as the death-rate of 1908. In 1909 the total number of animals was 305 less than in 1908, and the number of deaths 245 less. The weather conditions of 1909 were not at all good, so that the percentage of deaths is really more satisfactory than in 1908.

Of the 1492 animals which died, 1171 have been examined; of the rest, 131 were killed by order or by companions, 8 were preserved entire for anatomical purposes, and 182 were too decomposed for examination.

The following Tables show the facts ascertained in outline, and following them are some notes on the most important points.

Table I. sets forth the actual causes of death in each of the three great classes of animals. Under Reptiles are included batrachians and fishes.

TABLE I.—Analysis of 1171 Deaths.

Disease.	Mammals.	Birds.	Reptiles.	Reference to Notes.
1. Microbic and Parasitic Diseases.				
Tuberculosis	17	70	7	1
Mycosis .....	...	48	1	2
Malaria .....	...	14	1	3
Filaria	2	10	3	4
Hæmogregarines .....	...	...	19	5
Spirillosis .....	...	1	...	...
Worms	1	2	2	6
Pneumonia	43	79	64	7
Septicæmia	15	...	1	8
2. Diseases of Respiratory Organs.				
Pleuritis	3	...	...	...
Empyema	2	...	...	...
Broncho-pneumonia	51	...	...	9
Congestion of lungs	38	124	38	10
Bronchitis	1	...	...	...
3. Diseases of Heart.				
Pericarditis .....	...	1	...	...
Fatty degeneration	1	1	...	...
4. Diseases of Liver.				
Hepatitis	1	4	...	...
Fatty degeneration .....	...	7	...	11
5. Diseases of Alimentary Tract.				
Peritonitis	4	2	...	12
Gastritis	5	1	10	...
Gastric ulceration	7	...	...	...
Gastro-enteritis	11	5	27	13
Enteritis	40	181	40	...
Colitis	6	...	...	...
Ulcerative Colitis	4	...	2	...
Prolapse of Rectum	1	...	...	...
6. Diseases of Urinary and Reproductive Organs.				
Nephritis	11	8	1	14
Fibrosis of kidneys .....	...	4	2	...
Cystic kidneys .....	...	...	1	15
Inflammation of oviduct .....	...	6	...	...
7. Diseases of the Nervous System.				
Myelitis	2	...	...	...
8. Various.				
Sarcoma	3	...	...	16
Malnutrition	6	6	51	17
Abscess	2	...	1	...
Anæmia without ascertained cause .....	...	4	2	18
Injuries	7	24	1	...
No cause found	4	3	4	...
	288	605	278	

Table I. is made up from those diseases which actually caused death, but in more than half of the mammals and reptiles and in more than a quarter of the birds therein tabulated there were other pathological lesions which helped towards the fatal issue of the principal disease.

The following Table II. sets forth these secondary lesions; and if it be taken in conjunction with Table I., a much more accurate representation of the prevalence of disease in the Gardens will be arrived at.

TABLE II.—Other Diseases from which the Animals tabulated in Table I. were also suffering.

Diseases.	Mammals.	Birds.	Reptiles.
Tuberculosis	3	20	16
Mycosis .....	...	10	...
Malaria .....	...	9	2
Filaria	11	14	3
Trypanosomiasis .....	...	1	2
Hemogregarines .....	...	...	32
Worms	9	5	40
Hydatids	3	...	...
Sarcocystis .....	...	1	...
Pericarditis	4	2	1
Myocarditis fragmentosa	1	...	...
Dilatation of heart	1	3	1
Atheroma	2	...	...
Fatty degeneration of liver	5	30	4
Hepatitis	1	1	1
Cirrhosis of liver	2	...	...
Gastric ulceration	13	...	1
Gastritis	7	...	4
Enteritis (including Colitis)	17	30	12
Proctitis	1	1	1
Intussusception	3	...	3
Nephritis	26	6	1
Fibrous degeneration of kidneys ...	1	2	1
Rachitis	35	...	...

TABLE III. showing the distribution of the diseases in Table I. amongst the principal orders of Mammals.

Diseases.	Primates.	Carnivora.	Rodentia.	Ungulata.	Edentata.	Marsupialia.
Tuberculosis	7	...	5	4	...	1
Filaria	1	...	...	...	...	1
Worms .....	...	...	...	...	1	...
Pneumonia	10	13	8	3	2	7
Septicæmia	4	2	3	3	...	3
Pleuritis	1	1	1	1	...	...
Empyema .....	...	1	...	...	...	1
Broncho-pneumonia	21	7	5	9	3	8
Congestion of lungs	18	5	4	2	...	7
Bronchitis	1	...	...	...	...	...
Fatty heart	1	...	...	...	...	...
Hepatitis	1	...	...	...	...	...
Peritonitis	1	...	2	...	...	1
Gastritis	2	1	...	1	...	1
Gastric ulceration	1	...	2	4	...	...
Gastro-enteritis .....	...	3	2	1	1	4
Enteritis	9	5	8	3	2	13
Colitis (including ulcerative)	5	3	...	...	2	...
Prolapse of rectum .....	...	1	...	...	...	...
Nephritis	2	4	...	1	...	4
Myelitis	1	...	1	...	...	...
Sarcoma	1	...	1	1	...	...
Malnutrition	6	...	...	...	...	...
Abscess .....	...	...	...	1	...	1
Injuries .....	...	...	3	2	...	2
No cause found .....	...	1	2	...	1	...

Tuberculosis and Mycosis have again been the cause of a large number of deaths amongst the birds; the following table shows their relative incidence in the various orders of birds.

TABLE IV.—Comparative Table of the Incidence of Tuberculosis and Mycosis in the various Orders of Birds

Orders.	Tuberculosis.	Mycosis.
Passeres	19	6
Picariæ	17	9
Psittaci	3	3
Anseres	5	5
Columbæ	13	13
Gallinæ	20	8
Striges	9	8
Laridæ	4	5
Struthiones .....	..	1

If this table be compared with a similar one for 1908 it will be seen that there is no one class of bird particularly liable to either of these diseases, but that their incidence depends upon accident of position or infection.

Notes on the foregoing Tables.

The following notes refer to a few points of special interest in connection with the diseases mentioned in the tables:—

1. It will be noticed that there is a very satisfactory decrease in the amount of mammalian and reptilian tubercle in the Gardens. Although there has been a decrease also amongst the birds, there has latterly been a considerable increase in the number of cases in the New Bird House, mainly due, in all probability, to overcrowding, but also in part to structural defects. The decrease in the Reptile House appears to have been coincident with the use of sand in the cages, which is constantly changed.

2. All the cases of Mycosis have been due to the *Aspergillus fumigatus*.

3. Under the term Malaria are grouped cases in which intracorpuseular parasites, belonging to either the group of Halteridium or of Proteosoma, are found in sufficient number to cause death. In the worst cases as many as 70 per cent. of the erythrocytes have been invaded.

4. In all the cases entered under Filaria in Table I. there has been a considerable disorganisation of the blood, and in six of the birds there has been a plugging of the cerebral capillaries by the embryos of the parasite. These birds have died suddenly with so-called "fits."

On reference to Table II. it will be seen that Filaria have been found in many other cases, 43 in all. Identification in most instances has not been possible, as it is only in about a quarter of the cases that the parent worms have been discovered.

In a Wallaby there were present filaria in the body-cavity and embryos in the blood; and in the body-cavity of a foetus found attached in the pouch there was also a parent worm similar to those in the mother.

5. Haemogregarines have been found altogether in 51 reptiles, in some for the first time. It is proposed to make these parasites the subject of a further communication to the Society. The blood destruction in the 19 cases in Table I. was enormous, as many as 75 to 80 per cent. (in one case 92 per cent.) of the erythrocytes being invaded by the parasites.

6. The deaths recorded under Worms were due to their penetration through the stomach or intestinal wall; it will be seen from Table II. that they were present in 54 other animals. A tape-worm was found in the gall-bladder of a Wallaby.

7. Pneumonia in the Mammals and Birds has been mostly of the pneumococcal variety; in 9 of the reptiles it was a traumatic inflammation due to the irritation caused by the presence of ascaris eggs or embryos in the lungs. In some of these, which were more chronic, tubercular-like masses were formed in the lungs.

8. The starting-point of the septic absorption in these cases of septicæmia was, in most instances, abscesses connected with the teeth. Four Wallabies had pyorrhœa alveolaris. Two of the cases were due to the pneumococcus; and in a Gayal abscesses in the kidney, due to calculi, were the starting-points.

9. The cases of broncho-pneumonia were nearly all confined to the first and last three months of the year. In four cases (Monkeys) Friedländer's bacillus was the cause.

10. Of the 38 Mammals, the actual cause of whose deaths was congestion of the lungs, 14 had rickets badly. In the Birds, and especially in the smaller ones, owing to the structure and partial fixation of the lungs, this condition is very fatal, and is generally associated with more or less œdema of the lungs, and sometimes with effusion of fluid into the air-sacs.

11. It will be seen from Table II. that a large number of animals—39—had fatty degeneration of the liver. Most of these were small birds, and it may in these be due to inevitable over-feeding with no natural exercise.

12. Peritonitis in Mammals was in three cases due to a sloughing appendix; in the Birds the inflammation had spread from the oviduct.

13. On account of the large number of cases of inflammation of the intestinal tract, the investigation into the probable causes which was begun in 1908 has been continued. It seems certain that there are five distinct varieties of enteritis in the Gardens: one caused by errors in feeding; one caused by foreign bodies, *e. g.* peat, sand, hay, grass, etc.; one caused by worms, or by worm-cysts, in the walls of the intestines; one caused by bacteria; and, lastly, one caused by protozoal organisms. The first, fourth,

and fifth of the above probable causes are by far the most important. With regard to the first, after every Bank Holiday there are one or more deaths due to over-feeding or to unsuitable food having been given to the animals. Again, in 95 out of 223 Reptiles there was an inflammation of greater or less extent of the alimentary canal, which—as was urged last year—would seem to suggest that the present unnatural and unphysiological method of feeding the Snakes is not the right one. Often masses of quite undigested food are found, the necessary secretions failing, apparently on account of the natural stimulus of killing the animal being absent.

Of enteritis proper, 13 of the cases in Mammals and 48 of those in Birds were hæmorrhagic and associated with necrosis of the mucous membrane; and protozoal organisms, mostly amœbæ, were found in 49 of these. The bacterial cases occur mostly in the autumn, and some of these, I think, will have to come under the first division, since it seems probable that—at any rate, in some cases—the use of boiled milk, as is the case in children, may be the cause.

14. In an Iguana with nephritis, causing almost complete destruction of the kidneys, uric acid crystals were found in numbers in the blood.

15. In this case occurring in a Bull-Frog the kidneys were entirely converted into a transparent cystic mass containing clear fluid, and measuring 3 by 2 inches; the tissues and body-cavity were full of fluid.

16. Three new growths have occurred this year: one in a wild Swine in which both kidneys and both adrenals were involved. There were two separate tumours, one on each side of the spine. One of these was sent to the Museum of the College of Surgeons. A second one occurred in the kidney of a Lemur, and the third in the ovary of a Styan's Squirrel. They all belonged to the group of Sarcoma and were all mixed: in the Swine a small round-celled variety, with much hæmorrhage; in the Lemur a round-celled and fibrous variety, rapidly growing; and in the Squirrel it was mostly of the large round-celled kind.

17. Under this heading are included animals which have died from exhaustion, due probably to depressed vitality from cold or darkness, or from inability to get or take food, as has been the case with many small reptiles.

18. In these cases there was very profound anæmia with considerable blood-changes. It is most probable that these cases were all parasitic in origin, but no cause, parasitic or otherwise, could be found. In a Turtle-Dove the very rare condition of phagocytosis of the red corpuscles by the leucocytes was observed.